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AGRICULTURAL NEWS LETTER

VOL. 8 - NO. 4 JULY-AUGUST, 1940

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This publication contains information regarding new developments of interest to agriculture based on laboratory and field investigations of the du Pont Company and its subsidiary companies. It also contains published reports and direct contributions of investigators of agricultural experiment stations and other institutions as related to the Company's products and other subjects of agricultural interest.

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Vol. 8 - No. 4 July-August, 1940.

AGRICULTURAL NEWS LETTER

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DU PONT PURCHASES OF PRODUCTS OF THE FARM

Editor's Note:- The industrial use of agricultural raw materials is conceded to be one of the surest and soundest methods of bringing about the betterment of the farmer's condition. The following tabulated data on purchases of raw materials by the Du Pont Company is of interest because it indicates what one concern is doing toward the permanent improvement of agriculture.

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In 1939 the Du Pont Company purchased farm products for chemical consumption amounting in volume to 274,488,000 pounds with a cost value of $14,320,000.

This volume is accounted for in the table below:

Vegetable Oil	41,365,000 lbs.
Corn Products	12,855,000 "
Wood Pulp	141,000,000 "
Turpentine & Pine Rosin	8,416,000 "
Linters & Purified Cotton	59,400,000 "
Cotton fabrics, yarn, etc.	11,452,000 "

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LABORATORY EQUIPMENT FOR TEMPERATURE AND HUMIDITY CONTROL

By-
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Editor's Note:- The following article illustrates the extensive research work now going on in treatment of seeds against fungi and insects. It describes new equipment designed to control temperature and humidity, both while seeds are in storage and after they are planted. By this method the plant pathologist is able to determine the effect of these factors upon the seed itself and upon its chemical treatment.

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Ten years ago seed treatments for the control of surface seed-borne parasites were applied usually on the farm and only a day or so before planting. With the more general recognition of the economic importance of seed disinfection, many seed breeders and seedsmen have found it desirable and profitable to treat their seed before sale to the farmer. This practice of treating seed at its source has been supplemented by the establishment of seed treating plants at mills, elevators and gins and also by the mobile custom treating outfits traveling from farm to farm.

This transition of seed disinfection from a farm operation involving the treatment at most of a few hundred bushels of seeds to the commercial stage, in which many thousands of bushels are treated months in advance of planting, has presented new problems to those engaged in the development of fungicides of this sort.

One of the most apparent of these problems concerns the long storage period through which seeds treated commercially must usually pass before being planted. While some chemical disinfectants are entirely inert to seeds during long storage periods, others may cause more or less injury under at least some conditions. For example, it has long been known that seeds treated with formaldehyde should be planted promptly if injury is to be avoided. Insoluble and non-volatile compounds such as copper carbonate, on the other hand, are usually considered non-injurious during storage.

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CONTROLLED CONDITIONS

It is not the mere length of the storage period, however, which determines whether or not chemical injury to the seed will occur. Conditions of temperature, relative humidity and aeration are factors which may be more important than the length of the interval between treating and planting.

To study the effect of these environmental factors, the plant pathologist has called on the engineer to construct laboratory equipment in which the temperature and relative humidity of the storage atmosphere can be controlled and varied at the will of the investigator. Air-conditioned cabinets enable him to simulate in the laboratory almost any set of conditions which treated seeds are likely to encounter during storage.

For example, a new experimental seed disinfectant can be applied at known rates to several samples of seed. One lot can be stored at a temperature of 90°F. and a relative humidity of 85% to simulate a hot, humid climate. Another lot can be stored at a temperature of 20°F. and a relative humidity of 30% to provide a cold dry climate. At suitable intervals samples of the seed can be removed from storage and planted to determine whether seed injury has occurred under either set of temperature and humidity conditions. Laboratory studies of this sort on the effects of a given chemical on seeds stored under a wide range of atmospheric conditions should make it possible to predict fairly accurately the probable behavior of an experimental seed disinfectant under practical conditions.

INDIVIDUAL SEED STUDY NECESSARY

Temperature and humidity may affect the behavior of the chemical on the seed coat or the seed itself or both. For example, at the higher temperatures many chemicals are more active fungicidically and unfortunately also more apt to cause seed injury than at lower temperatures. High temperatures and high humidity tend generally to speed up the vital or life processes of the seed and thus make it more sensitive to the effects of the toxin on the seed coat. At low temperatures and low humidity the vital processes slow down and the seed often becomes less susceptible to injury by the chemical on its surface.

Since the extent of the influence of these temperature and humidity factors differs widely for the thousands of chemicals and the many sorts of seed concerned, it is obvious that each chemical and each sort of seed must be studied individually.

CONTROLLING SOIL TEMPERATURE

But the effect of chemical seed treatments as induced by environmental factors of temperature and moisture does not end when the farmer pours the seed into the planter. Temperature and moisture conditions in the soil may play an even greater role than these same influences in storage because of the extremely delicate condition of the seed and seedling during the period of germination. Thus it is necessary for those developing new disinfectants to resort again to laboratory equipment in which seed may be planted and held at controlled degrees of temperature and soil moisture.

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To illustrate the importance of soil temperature as a factor influencing the behavior of seed treatments, the results of one experiment with lima beans may be cited. Several lots of seeds were treated with various experimental disinfectants and planted in three lots of soil held respectively at constant temperatures of 80°, 65° and 50°F. When emergence began after three days at the higher temperature and five days at the two lower temperatures, all lots were removed to a temperature of 70°F. in the greenhouse.

Upon the completion of emergence it was found that untreated seed had produced stands of 72% for the seed held originally at a soil temperature of 80°F., 35% for the 65°F. soil and only 1% at 50°F. One treatment produced stands of 97%, 85% and 82% at the three respective temperatures. Another treatment, however, produced stands of 93% and 83% respectively for the two higher temperatures but only 38% for the lowest temperature. Obviously the first of these treatments may be expected to produce satisfactory results over a much wider range of soil temperatures than the other. The second chemical would probably give the lima bean grower good results in years when soil temperatures were normal or higher but in those occasional years when soil temperatures were low during unseasonable cool periods, the results would be much less satisfactory.

It should be made clear that as yet comparatively little is known about these factors of temperature, moisture and aeration as related to the effectiveness of seed treatments and the seed injury which they may cause. Heretofore most of the emphasis in developing seed disinfectants has been on the chemical itself with too little consideration of the influences of the storage and soil conditions. When we have learned more about the effects of these factors, we shall be in position to produce better seed treatments from the many organic and inorganic chemicals available for study.

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Vol. 8 No. 4. July-August 1940

THE NATION'S INVESTMENT IN AGRICULTURAL AND INDUSTRIAL RESEARCH

By F. W. Parker
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Wilmington, Delaware

EDITOR'S NOTE: Renewed interest is being manifest in the need for more state and federal funds for additional personnel and wider agricultural research, particularly in the fields of production, marketing, and utilization of farm products. In this connection, we asked the United States Department of Agriculture for information, covering the last 40 years, regarding (1) funds of the Department and of the State Agricultural Experiment Stations allocated annually to research, and (2) the number of employees annually engaged in this work by both. We wish to thank R. W. Trullinger, Assistant Chief, Office of Experiment Stations, and W. A. Jump, Director of Finance, U. S. Department of Agriculture, for supplying us with the data on funds and personnel presented herewith.

While there has been a steady growth in both personnel and funds spent by federal and state governments for agricultural research in the United States during most of the past 40 years, the total now being expended is slightly less than $45,000,000 annually. According to figures compiled by the United States Department of Agriculture, the federal and state governments in 1939 allocated $44,822,759 and employed approximately 9,954 persons for agricultural research.

The accompanying table and graphs show the growth of funds and personnel of the United States Department of Agriculture and the State Agricultural Experiment Stations devoted to research activities by years, from 1900 to 1939, inclusive. Funds allocated by decades during this 40-year period were:

Decade	U.S.D.A.	State Exp. Stations	Total
1900-09	$ 18,510,000	$ 14,597,923	$33,107,923
1910-19	48,400,000	34,937,486	83,337,486
1920-29	96,100,000	80,046,291	176,146,291
1930-39	163,300,000	149,303,509	312,603,509
Total	$326,310,000	$278,885,209	$605,195,209

It will be noted that the total expenditures were nearly ten times greater during the fourth decade than during the first decade. Turning to the larger table on the next page, a study of the figures by years shows that the total

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Funds Allocated to Research and Approximate Number of Employees Regularly Engaged in Research Work, Fiscal Years 1900 to 1939

Year	U.S. Department of Agriculture		State Agricultural Experiment Stations		Total	
	Funds*	Personnel*	Funds	Personnel	Funds	Personnel
1900	$ 760,000	345	$ 967,281	693	$ 1,727,281	1,038
1901	850,000	400	1,010,306	688	1,860,306	1,088
1902	1,200,000	500	1,089,771	710	2,289,771	1,210
1903	1,500,000	650	1,151,262	757	2,651,262	1,407
1904	1,700,000	850	1,242,392	795	2,942,392	1,645
1905	2,000,000	900	1,258,631	845	3,258,631	1,745
1906	2,300,000	1,050	1,669,902	950	3,969,902	2,000
1907	2,700,000	1,300	1,826,016	1,098	4,526,016	2,398
1908	2,900,000	1,400	2,099,559	1,143	4,999,559	2,543
1909	2,600,000	1,400	2,282,804	1,242	4,882,804	2,642
1910	3,000,000	1,550	2,664,370	1,403	5,664,370	2,953
1911	3,200,000	1,600	2,686,470	1,564	5,886,470	3,164
1912	3,500,000	1,800	2,932,798	1,574	6,432,798	3,374
1913	4,000,000	2,000	3,247,017	1,667	7,247,017	3,667
1914	4,500,000	2,200	4,000,772	1,852	8,500,772	4,052
1915	6,000,000	2,950	3,569,604	1,857	9,569,604	4,807
1916	5,200,000	2,850	3,743,824	1,866	8,943,824	4,716
1917	5,800,000	3,100	3,762,336	1,955	9,562,336	5,055
1918	6,300,000	3,200	4,156,205	1,684	10,456,205	4,884
1919	6,900,000	3,400	4,174,089	1,881	11,074,089	5,281
1920	7,700,000	3,650	5,034,442	1,968	12,734,442	5,618
1921	7,800,000	3,500	5,226,998	1,965	13,026,998	5,465
1922	8,200,000	3,650	6,341,140	2,166	14,541,140	5,816
1923	8,500,000	3,700	6,979,077	2,259	15,479,077	5,959
1924	8,400,000	3,600	7,555,027	2,385	15,955,027	5,985
1925	9,300,000	3,800	7,267,872	2,415	16,567,872	6,215
1926	10,200,000	3,850	8,926,818	2,827	19,126,818	6,677
1927	10,500,000	3,950	9,339,437	2,831	19,839,437	6,781
1928	11,700,000	4,050	11,414,680	3,013	23,114,680	7,063
1929	13,800,000	4,400	11,960,801	3,096	25,760,801	7,496
1930	15,500,000	4,600	13,142,105	3,254	28,642,105	7,854
1931	16,700,000	4,900	13,506,554	3,419	30,206,554	8,319
1932	17,400,000	5,100	13,858,097	3,564	31,258,097	8,664
1933	14,200,000	4,600	12,099,248	3,620	26,299,248	8,220
1934	12,000,000	4,100	11,065,469	3,567	23,065,469	7,667
1935	12,400,000	4,100	11,110,776	3,658	23,510,776	7,758
1936	15,200,000	4,500	16,356,179	3,818	31,556,179	8,318
1937	17,200,000	4,800	17,694,253	3,924	34,894,253	8,724
1938	18,500,000	5,300	19,848,068	4,219	38,348,068	9,519
1939	24,200,000	5,500	20,622,759	4,454	44,822,759	9,954
Total	$326,310,000		$278,885,209		$605,195,209	

*approximate

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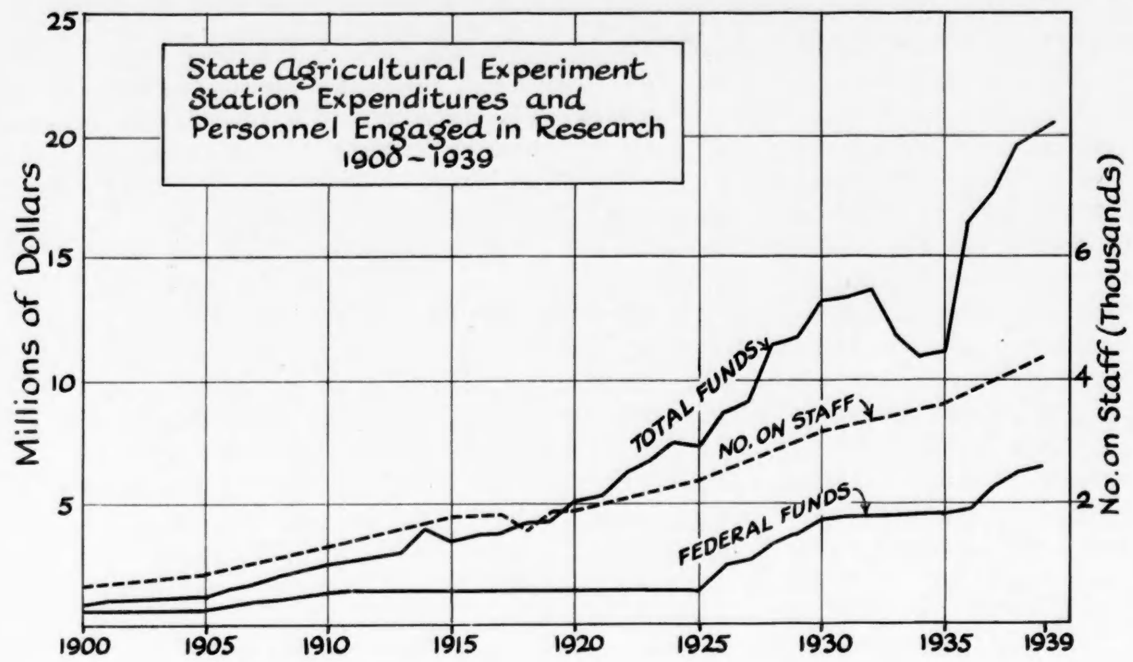
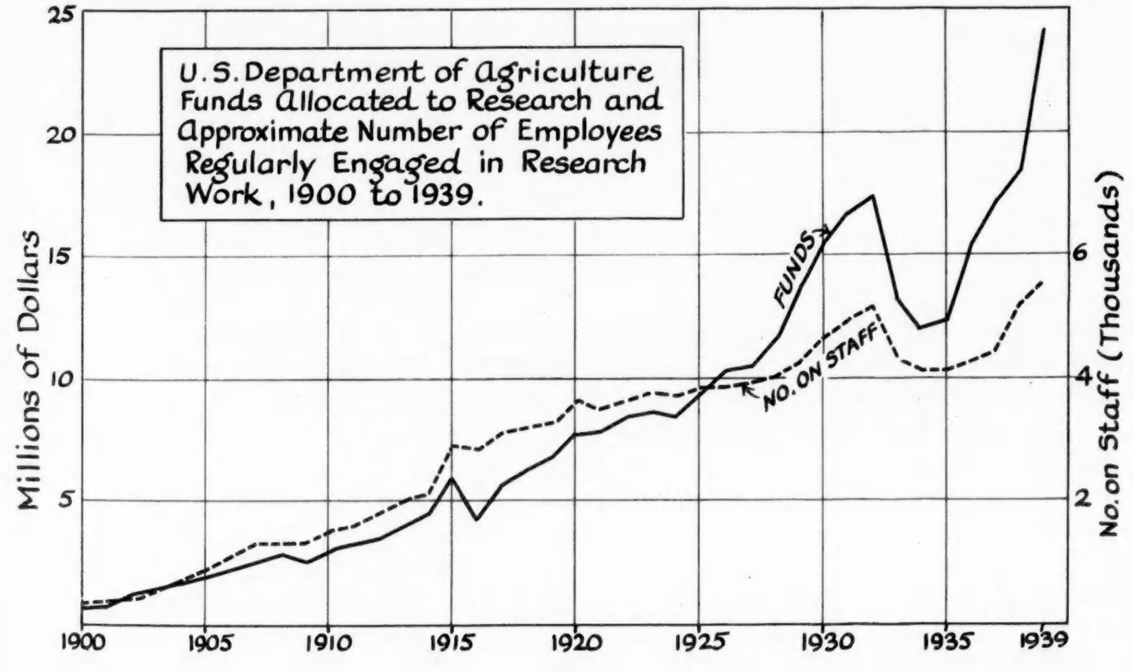


State Agricultural Experiment Station Expenditures and Personnel Engaged in Research 1900 ~ 1939
Millions of Dollars
No. on Staff (Thousands)
TOTAL FUNDS
NO. ON STAFF
FEDERAL FUNDS
25
20
15
10
5
6
4
2
1900
1905
1910
1915
1920
1925
1930
1935
1939



U.S. Department of Agriculture Funds Allocated to Research and Approximate Number of Employees Regularly Engaged in Research Work, 1900 to 1939.
Millions of Dollars
No. on Staff (Thousands)
FUNDS
NO. ON STAFF
25
20
15
10
5
6
4
2
1900
1905
1910
1915
1920
1925
1930
1935
1939

expenditures dropped from a pre-depression high of $31,258,097 in 1932 to $23,065,469 in 1934, but that this loss was more than made up by 1936, when the total again reached $31,556,179. The diagrams show that the depression drop in total expenditures was due entirely to the sharp decrease in non-federal funds spent by the State Agricultural Experiment Stations plus the drop in U. S. D. A. funds. The total increases from 1935 to date were quite substantial so that the amount for 1939 reached $44,822,759, of which about $24,200,000 was for the U.S.D.A., and $20,622,759 for the State Experiment Stations. About one-third ($6,541,250) of the State Experiment Station expenditures in 1939 was supplied by federal funds allocated to the states. In this connection, it is of interest to note that while federal funds allocated to the State Experiment Stations each year increased steadily during the 40-year period, these increases have not been as great, comparatively speaking, as have the increases in non-federal funds. From 1900 to 1909 inclusive, federal funds constituted 60 per cent of the total used by the State Experiment Stations. The next decade, 1910 to 1919, the federal contribution, while considerably larger than the previous decade, represented only about 42 per cent of the total; and from 1919 to 1929 only 26 per cent. From 1932 to 1939 it was approximately one-third of the total, as compared with about three-fifths during the first decade of the century.

The personnel figures show that the total number of research workers increased from a little over a thousand in 1900 to nearly 10,000 in 1939, as follows:

Year	U.S.D.A.	State Exp. Stations	Total
1900	345	693	1,038
1910	1,550	1,403	2,953
1920	3,650	1,968	5,618
1930	4,600	3,254	7,854
1939	5,500	4,454	9,954

It should be borne in mind that, while the number of research workers at the State Experiment Stations has increased regularly from decade to decade, only about half (2,244 of the 4,454 in 1939) were full-time research workers, that some (1,974) did part-time teaching, while others (163) assisted with farmers' institutes, and a few (73) did extension work, too. Of course, some of the U. S. Department research workers' activities overlap into other fields, but for the most part this group is occupied with full-time research work.

The data for years show that the drop in total expenditures in 1933 and 1934 was accompanied by a corresponding drop in total personnel, which went from 8,664 in 1932 to 7,677 in 1934. However, by 1936 the total number of research workers had again reached 8,318, following which there were sizeable annual increases until 1939, when the total reached an all-time high of 9,954.

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Industry Spending Quarter of a Billion Dollars Annually

The total spent for agricultural research by the United States Department of Agriculture and the 48 states of the Union was only about 20 per cent as much as the estimated $250,000,000 spent last year by the industrial organizations of this country. A study of the amounts spent by industry and by the state and federal research agencies, therefore, shows that not only is private industry spending more than five times as much for research annually than are the agricultural agencies, but that industry has spent as much or more (probably $600,000,000 to $750,000,000) during the past three years than the combined agricultural agencies have spent (approximately $605,000,000) during the past 40 years.

The amount of money that private industry now spends for research each year is generally given, as indicated, as a quarter of a billion dollars. For instance, "The New York Times Magazine", May 19, 1940, carries an article "Boundless Frontiers of Science" by Waldemar Kaempffert, which states that "some 1,500 industrial and consulting laboratories employ 25,000 people and spend annually $250,000,000" for research. The National Research Council has compiled considerable information on industrial research. Some of the data are given in National Research Council Bulletin 102 "Industrial Research Laboratories of the United States", Sixth Edition, December, 1938. This bulletin, which can be secured from the Council, National Academy of Sciences, Washington, D. C. ($2.50), while not stating the amounts spent for research does list 1,769 industrial research laboratories, and gives valuable facts about personnel and the types of research being conducted. William A. Hamor of the Mellon Institute, in the News Edition of "Industrial and Engineering Chemistry", January 10, 1940, states that in 1939 there were nearly 32,000 scientists and engineers engaged in research on behalf of 2,000 individual companies in the United States. He adds that "probably as much as $215,000,000 was expended by these manufacturers in industrial research". The chemical, petroleum, and electrical laboratories have close to half the industrial research workers of the country. E. I. du Pont de Nemours & Company, Inc., alone has an annual research budget totaling more than $7,000,000, which is equal to about 16 per cent of the nation's agricultural research expenditures. About 110 individual companies in the field of chemical industry and 40 trade associations are making research grants to educational institutions. About 250 manufacturing corporations are sustaining long-range investigations in research foundations. A considerable number are regular or occasional clients of the 250 consulting laboratories of the country.

Money Spent for Research is an Investment

Persons interested in the expansion of agricultural research facilities by the state and federal governments have been encouraged by the steady and healthy growth of agricultural research, especially during the last 10 years which shows an increase in appropriations from $25,760,000 to $44,822,000. Expenditures and personnel must continue to grow if our agricultural agencies are expected to meet the demands continually made on them.

Money spent for research is an investment. Any critical examination of the returns secured from the public's $605,000,000 investment in agricultural research in the past 40 years will show it has given and still is giving excellent returns. Our present annual expenditure of $44,822,000 will undoubtedly yield a very high return. Surely if private industry finds a $250,000,000 investment in industrial research essential, the federal, state and other agencies can profitably increase expenditures for agricultural research.

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RESULTS OF A 3-YEAR VERTICAL DRAINAGE EXPERIMENT

By-

L. F. Livingston

Results of a recent experiment by the Du Pont Company indicate the procedure which should be followed in draining wet spots in cultivated fields by subsoil blasting.

It has been found that if sand or gravel lies within 10 feet of the surface, the land owner has better than a 50-50 chance of getting satisfactory vertical drainage by blasting with dynamite.

The procedure recommended to determine whether subsoil drainage is feasible is as follows:

Make a soil profile at the wet spot showing:

(a) depth of top soil
(b) depth of impervious subsoil
(c) depth or location of sand, gravel or water-carrying strata, if any.

If the soil profile shows the water-carrying stratum is close enough to the surface to indicate blasting will remedy the wet condition, there still remains the question of whether the water-carrying stratum can take care of the additional surface water drained into it during periods of heavy rainfall. Since there is no economical way to determine this in advance, the only answer is to try it out.

At the Bayer-Semesan Minquadale, Del. Experiment Station a one-acre wet spot was examined in July 1937. The soil profile showed a loam top soil 15 inches deep, a white clay subsoil 6 feet deep, and a sandy gravel below that. On August 1, 1937, twelve holes were made with a 2-inch soil auger on 30 foot centers and 8 to 10 feet deep. Four pounds or 8 sticks of 40% Red Cross Extra dynamite were loaded in each hole in vertical columns with at least 18 inches of dirt tamped on top of each load. When the shots were fired very little soil was blown into the air, and few craters appeared. After each rain vertical drainage in the area was sufficient to protect field crops from damage.

The final step, taken December 1, 1937, was to dig a 10-inch hole, 8 feet deep at the point of each blast. This was comparatively easy because the soil was well broken. Six-inch drain tile was set vertically in each hole, and held in place by packing with sand, which acts as a filter to keep out clay particles.

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Each tile column was capped 15 inches below the surface to protect it from cultivating tools and plows.

In June, 1940, Gilbert F. Miles, Director of the Station reported drainage was 90% satisfactory. Materials required to drain this one-acre spot were 50 pounds of 40% Red Cross Extra dynamite, 100 feet of 6-inch drain tile and 12 concrete tile caps.

Results of the experiment are being published by the Du Pont Company to answer the thousands of inquiries received from farmers throughout the country concerning subsoil drainage.

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AUTUMN MONTHS FOUND BEST FOR PAINTING

By-
R. C. Sheeler
Paint Technician
E. I. du Pont de Nemours & Co.

Editor's Note:- The use or non-use of paint on the farm has long been a subject of discussion particularly by agricultural engineers. Its use is considered of such importance that this news letter expects to bring to its readers information about paint and painting as new products and methods are developed.

Many years of paint study and observation indicate that the months of September and October offer the most nearly ideal weather for exterior painting. Outside work may be done at any season as long as temperature is above freezing and the surface to be finished is dry, but autumn may properly be considered the preferred period.

At that time, a thirsty surface well adapted to absorption is offered, the result of the summer's dryness and the heat drawing water from wood pores, brick and stucco siding. Paint forms a better bond with a dry, porous material. The danger of moisture being sealed up behind the paint film, causing "blisters" or "peeling" is also minimized.

Exterior paints need to be anchored firmly to their surfaces. A moist, greasy or slippery surface prevents this rigid adhesion. On the other hand, a slightly roughened base which has been washed by spring rains and thoroughly dried by the summer sun provides a safe anchorage. The film-forming oils and pigments, employed in the new self-cleaning paints, readily anchor themselves to a dry, clean surface. Protection from sun, wind, rain and decay is not only sustained, but the paint remains clean and attractive throughout the film's natural life.

Insects, which in warmer weather settle on recently painted surfaces and mar the smoothness of the drying film, are less active in fall. There also is reduced possibility of sudden dust and rain storms. Drying is faster in the more brisk and airy weather which generally accompanies fall.

Temperature, moisture and general weather conditions, of course, exercise a profound influence on paints, and their effect is subject to continuous research and study. The actinic rays of the sun, for example, are shown by Du Pont investigations to be highly destructive to outside paints.

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Recently, a group of trim paints were subjected to special exposure tests in Hialeah, Florida. One half of each wood panel was painted with the usual type of linseed oil green and the other half with standard Du Pont "Trim and Trellis Green." The panels were exposed for six months at a forty-five degree angle facing south, comparable to more than a year of normal vertical exposure.

The results were significant. The hot, actinic rays of the Florida sun caused the linseed oil paints to fade badly. Dirt and mildew spores were collected on the surface. Many linseed oil paints react in this manner to the actinic rays of the southern sun, and a similar reaction is apt to occur over a period of time in northern districts.

The Du Pont panels retained their original color and appearance, the condition of the film being adjudged "highly satisfactory." The major factor in the performance was the "Dulux" oil used in the manufacture. It also dries rapidly enough to reduce the danger of dust, dirt, insects or rain spoiling the smoothness of the finish before it is dry. This type of finish is more resistant to mildew and other fungus growth which frequently attack linseed oil paints.

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DU PONT FAIR EXHIBIT IS FFA HEADQUARTERS

The Du Pont "Wonder World of Chemistry" exhibit at the New York World's Fair has been designated as official headquarters of the Future Farmers of America during "Farm Week," which will be marked at the Fair August 12-18. Special activities of interest to agriculturists will be incorporated into the Du Pont show during that period. FFA members attending the Fair will register at the exhibit and use it as a base from which to participate in the many-sided program arranged.

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PRO-TEK - AN UNSEEN GLOVE

By-
C. A. Weslager,
Chemical Specialties Sales,
E. I. du Pont de Nemours & Co. (Inc.)

Editor's Note:- Here is the description of a new protective coating for the skin. Already widely used by painters, it may have wide application for men and women in agriculture. The author offers all a chance to participate in a research program which may develop such uses.

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The far-reaching influence of chemical research has again been practically demonstrated in the diversified application of a Du Pont product known commercially as "Pro-Tek".

This product, a greaseless cream with a texture not unlike cold cream, was originally formulated to protect painters' hands against the stains of paint and varnish. It is applied to the hands and arms before painting. It immediately dries and forms an unseen film on the skin which prevents paint stains from adhering and clogging the pores. To remove it, the hands are held under running warm water, which dissolves the protective film, causing the stains to wash away. The film lasts from 3 to 4 hours if no water is allowed to contact the skin.

Augmenting this use, it was found that "Pro-Tek" also protected the workers' skins from grease and oil stains. Thus, mechanics and machinists found an answer to one of their problems. In fact, laboratory tests show that "Pro-Tek" affords excellent protection against several common foreign substances which cause dirty hands: dirt, paint, grease, oil, coal dust, ashes, soot, some inks, etc.

AN AID TO SAFETY-

In addition to "Pro-Tek's" unique resistance to foreign materials, it was observed that workers who were previously subject to skin irritation and minor industrial dermatitis, caused by their allergy to one or more of the substances just named, were relieved by using "Pro-Tek". Moreover, safety representatives of several leading insurance companies have not hesitated to recommend "Pro-Tek" as a safety aid where the employees' hands are exposed to irritants or to certain solvents which tend to dry the skin by removing its natural oils. The protective cream is applied to the skin before working, and the film functions

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as a preventive coating. Inasmuch as this film, with the collected foreign material, is readily dissolved in water, it is unnecessary for the workman to use harsh abrasives to clean his hands. The elimination of abrasive soaps in favor of plain water also eliminates another source of irritation to some sensitive skins, especially those of feminine workers. Evidence has also originated among a number of dry cleaners which indicates that "Pro-Tek" has been effective in protecting their hands and arms against common cleaning solvents.

While little practical experimentation has been projected in the field of insecticides and fungicides, it is not impossible that "Pro-Tek" may have limited application in this field as well as in other agricultural activities where the hands are exposed to the type of harmful irritants which do not penetrate the "Pro-Tek" film. An indication of its potential comes from the Highway Department of one of the Eastern states. It is reported that highway workmen successfully use "Pro-Tek" as an aid in protecting their hands and arms from poison ivy.

NEW USES ARE SOUGHT-

Obviously, no pretense is made to claim cure-all properties for the product. Against certain chemicals, for example those with a major aqueous content, "Pro-Tek" offers no protection, since its film is soluble in water. Its degree of protection also varies with the individual who may be actively allergic to some chemical. Thus, it would be unwarranted to attempt specific recommendations in an unexplored field so broad as that of agriculture. It is suggested that the experimenter who is faced with a problem against which "Pro-Tek" might be efficacious, make any necessary practical tests on his own initiative to determine if the product is applicable to the specific situation. New uses may thus be discovered which can be publicized among other workers in the agricultural field. Samples for this purpose can be obtained by addressing the writer.

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PROTECTING FOOD IN COLD STORAGE LOCKERS

By-

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More than 1,000,000 American families are now keeping supplies of fresh frozen foods in commercial lockers in central cold storage plants. The development is an outgrowth of improved freezing and refrigeration methods, a logical step in the path of the "frozen-food" industry. A few ice plants in the past maintained occasional lockers, generally for the use of hunters who wished to preserve deer or other choice game. During the past three years, the business has experienced an extraordinary growth, particularly in the Midwest. Iowa alone has nearly 300 of these plants. Home units are now making their appearance.

The entire frozen-foods development is regarded as one of extreme significance. It represents an entirely revolutionary conception of one of man's basic problems. For centuries the smokehouse and drying bin offered the only facilities for storing edibles for future use. The cooking and vacuum sealing method was a departure of prime importance, and later the tin can brought a vast change in living habits. Quick-freezing promises equally drastic consequences in dietary habits. It has broken down seasonal food restrictions, and its safe-guarding of essential elements in foods may influence the nation's health.

An important factor in the storage of frozen food is the material in which the food is wrapped. Air in low temperature storage rooms has a low relative humidity, as most of the moisture tends to condense on the refrigerating coils. Frozen foods are thus subjected to desiccation or dehydration unless protected by a moisture-proof wrapping or package.

The physical characteristics of the freezing process impose exacting duties on the packaging material. As temperature decreases and the dew point recedes, there is a tendency to draw the flavorful moisture from meats and poultry. This not only spoils flavor, but impedes plant efficiency as the moisture condensing on the coil acts as an insulator.

Improperly wrapped meat and poultry frequently show freezer burns, unattractive white areas from which all flavor is irretrievably gone. Unprotected beef will accumulate a solid matted cover of gray fibres resembling a cellulose building board as dehydration and oxidation set in.

Necessity for such a material led to a research program by the "Cellophane" Division of the Du Pont Company. Requirements included low moisture-vapor permeability, an inert surface, low cost and ready adaptability to fabrication. Further, it was necessary for the wrapping to be proof against grease, oil, and blood.

Continued on next page

A special moisture-proof "Cellophane" cellulose film for frozen foods is the result of this work. This film satisfies all the requirements as a wrap for a variety of products, and specially constructed leak-proof bags are available for syrup-packed fruits. These are tightly sealed and inserted in cardboard cartons. The basic cost of bag and carton is less than that of ordinary containers.

The new film is now widely used in commercial frozen food production and is finding considerable favor in locker plants. The ease with which it may be wrapped, even on portions of irregular shape, has commended it, together with its low space requirement.

A series of investigations conducted at the New York State Agricultural Experiment Station recently weighed the relative merits of various wrapping materials. The special "Cellophane" film was adjudged entirely satisfactory for locker use after extensive tests which gave consideration to moisture-transmission, stain-proofness, flavor imparted, condition at zero temperature, brittleness, appearance and other properties. The Station's bulletin, "Freezing and Storage of Foods in Freezing Cabinets and Locker Plants," by D. K. Tressler and C. W. Du Bois, comments that "patrons of locker plants and users of farm freezing plants should use discretion in selecting the proper material for packaging foods to be frozen. The owners and operators of locker plants should aid their patrons to the utmost in selecting and securing wrapping materials that will satisfactorily protect frozen products from drying out and from contamination while in storage."

The Bulletin explains: "Because of low relative humidity and the constant circulation of the air, frozen foods held in storage dry out quickly unless they are protected by a moisture-vapor-proof wrapper or package. Products which dry out in storage quickly become rancid, take on foreign flavors, become tough, and are dry when cooked. In the case of meat and poultry, the protector generally used is moisture-vapor-proof film.

"Waterproofness should not be confused with moisture-vapor-proofness, since a paper may be waterproof without being water-vapor-proof. A moisture-vapor-proof material is one that will prevent moisture vapor from passing through.

"It is important that a wrapping material not only prevents the drying out of the food, but also protects the food from absorbing flavors and odors which may be present in storage. It is also important that the paper does not crack or become brittle at low temperatures, neither must it absorb grease, oil, water, or blood, or impart a flavor to the product."

The "locker" idea is the answer to the consumer who wants "to freeze his own." It affords a convenient, economical method of having fresh foods the year 'round by utilizing the facilities of a central freezing and storage plant.

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NYLON LEADER BOOKLET

The fine art of tying knots for fishing is treated with carefully drawn diagrams and clearly worded instructions in a handbook just published by the Plastics Department of the Du Pont Company.

Special attention is given to the approved knots for tying nylon leaders at the tippet end. A series of diagrams is used to illustrate each of the three knots found to be safest for nylon. These knots are the Turle, the Figure Eight, and the Return.

Methods of tying nylon to nylon and lines to leaders are explained. Diagrams and text also explain how to tie ringed hook and swivel knots, bait hook knots, loop knots, and dropper knots. Investigation to determine the best knots for nylon leaders was undertaken after fishermen found that nylon had a tendency to slip out of the old overhand jam knot at the tippet end.

The handbook is called "What You Ought to Know About Nylon Leader Material." It is being distributed free to fishermen upon request to the Plastics Department, E. I. du Pont de Nemours & Company, Arlington, N. J.

The story of nylon itself---how it was developed, how it is manufactured, and how it is taking an important place in industry---forms an interesting section of the booklet. A series of questions and answers on nylon is included.

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